Point-of-Care Analysis of Neutrophil Phenotypes in Geriatric Hip Fracture Patients

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Purpose: Frail, geriatric patients presenting with hip fracture and multiple risk factors are associated with high adverse outcomes after hip surgery. For these patients the amplitude of the immune response after the trauma is possibly related to the development of infectious complications after surgery. Changes in the neutrophil compartment can be used as read out of the amplitude of the immune response prior to hip surgery. The study aim was to test whether 24/7 point-of-care analysis of neutrophil marker expression by automated flow cytometry can be achieved after trauma.

Methods: A prospective cohort study was performed in a Level II trauma center. All geriatric trauma patients (age ≥70 years) with hip fracture presented to the emergency department. An extra blood tube was drawn from all patients. Thereafter, a member of the trauma team placed the blood tube in the fully automated flow cytometer (AQUIOS Load & Go), which was located in the room next to the trauma. The trauma patients with a hip fracture with serious adverse events (30-day mortality or developed major infectious complications) were compared with geriatric trauma patients with hip fracture without adverse events during follow-up.

Results: The trauma team was able to successfully start the point-of-care automated flow cytometry analysis within 60 minutes in all patients, 44/50 patients were analyzed in 30 minutes or less, resulting in an 88% success rate. Geriatric trauma patients who had serious adverse events had significantly lower CD10 and CD11b neutrophils at admission before hip surgery compared with geriatric trauma patients who did not develop major infectious complications.

Conclusion: This study showed the feasibility of the implementation of a fully automated point-of-care flow cytometry system for the characterization of the cellular innate immune response in trauma patients. This study supports the concept that the assessment of activated CD10 and CD11b neutrophils can be used for early detection of geriatric patients at risk for infectious complications. Furthermore, this can be used as a first step toward immuno-based precision medicine of geriatric patients for hip surgery.